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This second in a series of three papers on the Associated Staff Training Program of the Foreign Language Innovative Curriculum Study concentrates on the problem solving strategy employed by the program's specially trained innovative agents--the Instructional Systems Consultants (ISC). The problem-solving method used is first illustrated by citing the experiences of a Spanish teacher and an ISC in a Michigan high school. It is then further described by a summary of the ten stages involved in the problem-solving process (Table 1 in the appendix), and by a flowchart of necessary ISC decisions and actions according to the sequence in which they would be performed (Figures 1, 2, and 3 in the appendix). For related discussions see FL 001 009 and FL 000 915. (AF)

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A Problem-Solving Model for Instruction[1]

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The primary responsibility of the Instructional Systems Consultant (ISC) is to solve instructional problems. How to train such a person poses a challenging problem. Providing a set of ready-made solutions to instructional problems would be a typical answer. However, as Dr. Geis has noted, we view as futile the dispensing of a new batch of educational panaceas. The most useful innovation, in our view, would provide a method or strategy which could be used to investigate and resolve any instructional problem. This was our challenge; the development of such a method has been a major task of the Associated Staff Training Project.

Let me describe the problem-solving strategy we have evolved by using an example. Picture a high school Spanish teacher who has just dismissed her last class of the day. Also imagine an ISC who sees himself acting as an associate of the teacher and not as an administrator. The teacher walks into the ISC's office and asks if he has any ideas which would help her with her first year Spanish classes. The ISC asks her to elaborate and she states that "lots of the kids don't respond during the question and answer sessions." After finding out the quantity and quality of student responses which would

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satisy this teacher, the ISC suggests a plan to ascertain more detailed information concerning the type and number of responses the students make in a typical week. The plan includes how to categorize the responses, how to make frequency counts of such behavior, and a graph for plotting the data. A week later, the ISC and the teacher analyze this information. The teacher is surprised to learn that, for many students, the problem is even greater than she originally suspected. The problem is now classified according to an analysis procedure which the ISC has been trained to use. In light of the data, the teacher's description of the nature of the solution, and other student test information, this particular problem appears to be one of increasing the rate of student responses. The student behaviors which the teacher desires appear to be responses which the students are usually capable of making rather than responses which must be taught. The teacher and the ISC devise a system for increasing the payoff to the student who responds. Instead of the usual nod of approval from the teacher, the student records that he has made a correct response by means of a small graph on a 5 x 8 card which he hands in at the end of the period. Several months later the teacher and the ISC note that rates of response in class have risen markedly and they agree that this innovation has, according to the evidence, helped solve the original problem. The ISC revises the wording on the graph to reduce some problems of misinterpretation which occurred. He also prepares a dittomaster so that the teacher can run off additional copies when needed. The ISC writes a brief description of these activities for the school system's teacher newsletter.

This is a typical example of an ISC using the problem-solving strategy. At least it is as typical as possible in a setting that presents a vast range of problem types and importance. And, I should note, it is not a fictitious example. It is based upon the actual experiences of an ISC in one Michigan high school.

A more complete description of the strategy is presented in the summary of ten stages in the problem-solving process. This is Table I in the appendix.

As you look over these ten steps you will see that this model has some obvious analogues to scientific research. There is a heavy emphasis on a detailed explication of the problem, the problem is cast in measurable terms, an effort is made to identify and take into account all significant independent variables, and the result is judged on the basis of the discrepancy between the measured and the hypothesized change in the dependent variable.

This method of problem solving is presented in still another manner in Figures 1 and 2 in the appendix. Here, the description is in terms of a flowchart of necessary ISC decisions and actions arranged according to the sequence in which they would normally be performed. Any instructional problem-solving activity (including the example which has been given) can be described in terms of a particilar path through the operations and decisions contained in the flowchart. Notice, incidentally, that the process is truly cooperative; both the ISC and teacher are involved at almost every step.

Perhaps as interesting as the particular routine itself is its empirical development. The original design was based upon experiences of staff members in educational settings both in teaching and in consulting with teachers. Initial drafts were based on the answer to the question "What do I do when I attempt to help the teacher solve a problem?" The answers were transformed into a series of flowcharts. As each section of the routine was developed, it was challenged by teacher problems posed by another staff member. The staff had collected such problems by means of a questionnaire distributed to language teachers throughout Michigan. The flowcharts were revised until deliberately difficult and unusual instructional problems could be resolved by use of the strategy. In other words, each time a challenging problem bogged down in the flowchart, the chart was changed; a process quite similar to debugging a computer program. At this point the staff (playing the role of the ISC) used the strategy with teachers in nearby schools. Again, more revisions were made until it worked smoothly.

The same process of empirical development was carried out for each one of the critical segments of the overall design. Each of these sections was expanded into a separate flowchart and went through extensive tests and revisions. In this manner, a successively more detailed job description of the ISC's problem-solving activities was gradually developed. One example of a detailed flowchart can be found in Figure 3 of the appendix. It expands the activities called stages 2 and 4 in the Table and on the previous flowchart. This description <u>via</u> flowcharts of the instructional problem-solving process continues to be tested and revised as a result of field experiences.

A final word about the justification of this strategy. To us, the strategy is a good one because it works. In our continual testing and revising of the strategy, it has proven useful in the solution of any type of instructional problem. It may seem cumbersome; it may lack aesthetic appeal. But each successive version has proven more comprehensive, more useful and more practical. Although we have not unearthed any buried treasure in the form of new curricula materials or teaching methods, we have drawn a treasure map for the solution of instructional problems. Reuben Chapman will describe how the ISC trainees learn to read that map.

Appendix to accompany

"A Problem-Solving Model for Instruction"

Appendix - 1

Table I - Ten Stages in ISC Problem-Solving

Stages in Problem-Solving Process	Activities of the ISC Trainee
1. The teacher brings an instructional problem to the trainee.	The trainee continuously provides an atmosphere which encourages trainee-teacher contact.
2. The problem is transformed into a series of statements concerning actual and desired student behavior.	The trainee and the teacher cooperatively arrive at an objective statement of the problem. Together they devise a set of criteria which describe successful student performance.
3. The problem is assigned a rank on a hierarchy of importance.	The trainee considers a variety of weighting factors such as feasibility, cost and impact. The teacher and the trainee select the most appropriate problems.
4. The existence of the problem is verified.	The trainee and teacher construct a measuring instrument (e.g., a test). The test is administered to the appropriate population to determine whether or not the problem, as now defined, is a real one.
5. A solution for the problem is designed.	The trainee makes an analysis of the problem, attempting to isolate relevant contributing variables. He divides the problem into subtasks. He examines existing student repertoires and the existing instructional system. He designs a trial solution.

6. The solution is specified.	A search is made for existing materials, or procedures which might be useful. A search of present teacher practices is made for any applicable materials and practices. Appropriate materials or procedures are selected, or if necessary, new materials or procedures are developed.
7. The solution is checked for acceptance.	The trainee estimates the effect the solution will have upon other variables in the educational system and the effect these variables will have upon the solution.
8. The solution is implemented.	Developmental testing is begun if new materials are to be constructed. Small-scale tryouts are conducted.
9. The efficacy of the trial solution is determined.	Pre- and post-testing is used, as well as student interviews, to find out if the solution works. Later, larger tryouts of a "field-test" sort are conducted. Solutions which do not solve the specified problem are revised.
10. If successful, the application of the solution is expanded and maintained.	The solution is applied to the whole target population (e.g., the class, a single student, an entire school). The results are disseminated to other interested parties. An appropriate maintenance system is devised and implemented.

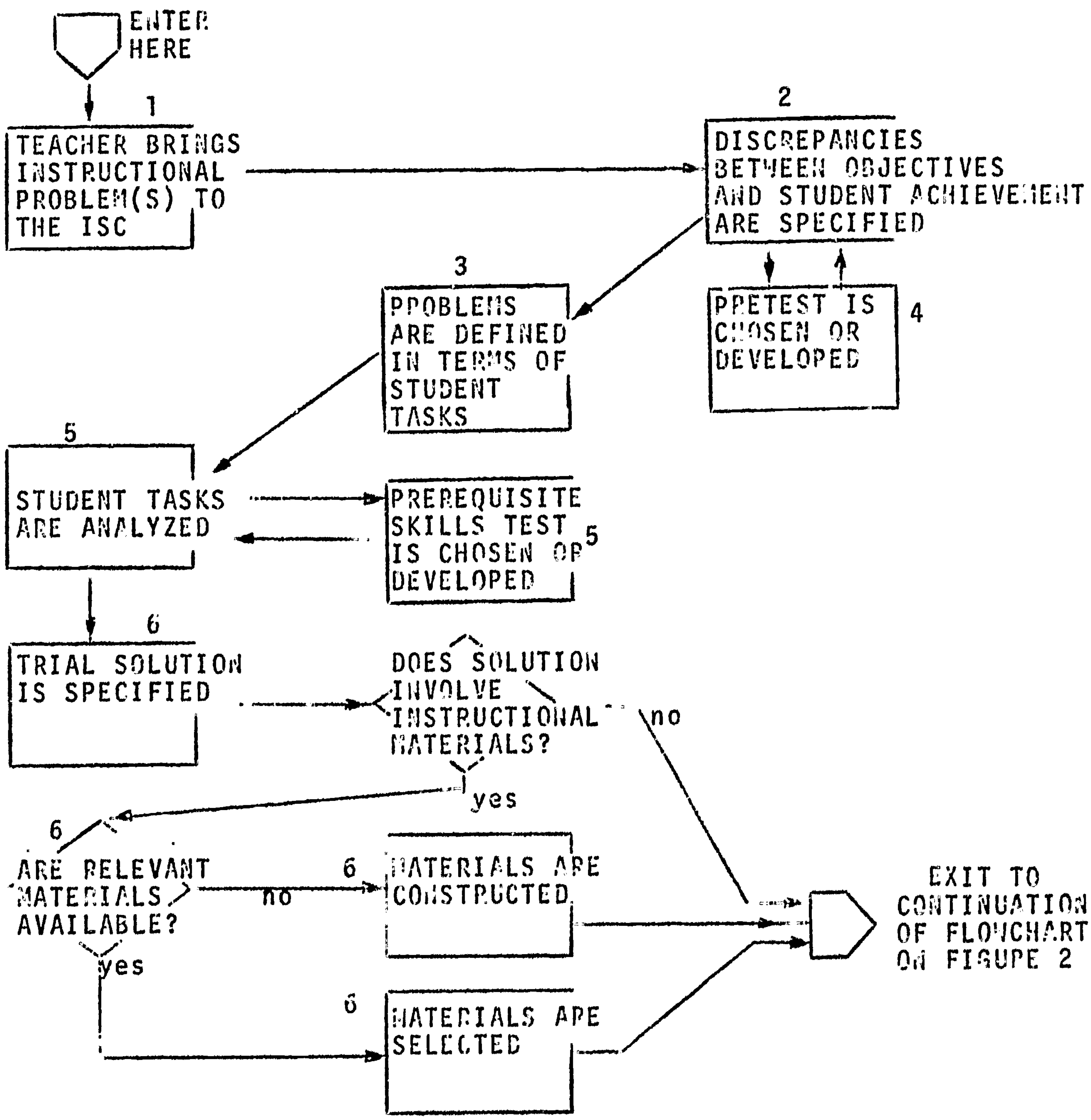

FIG. 1. AN OVERVIEW OF THE INSTRUCTIONAL PROBLEM-SOLVING PROCESS

The numbers corresnond to the activities described in table 1

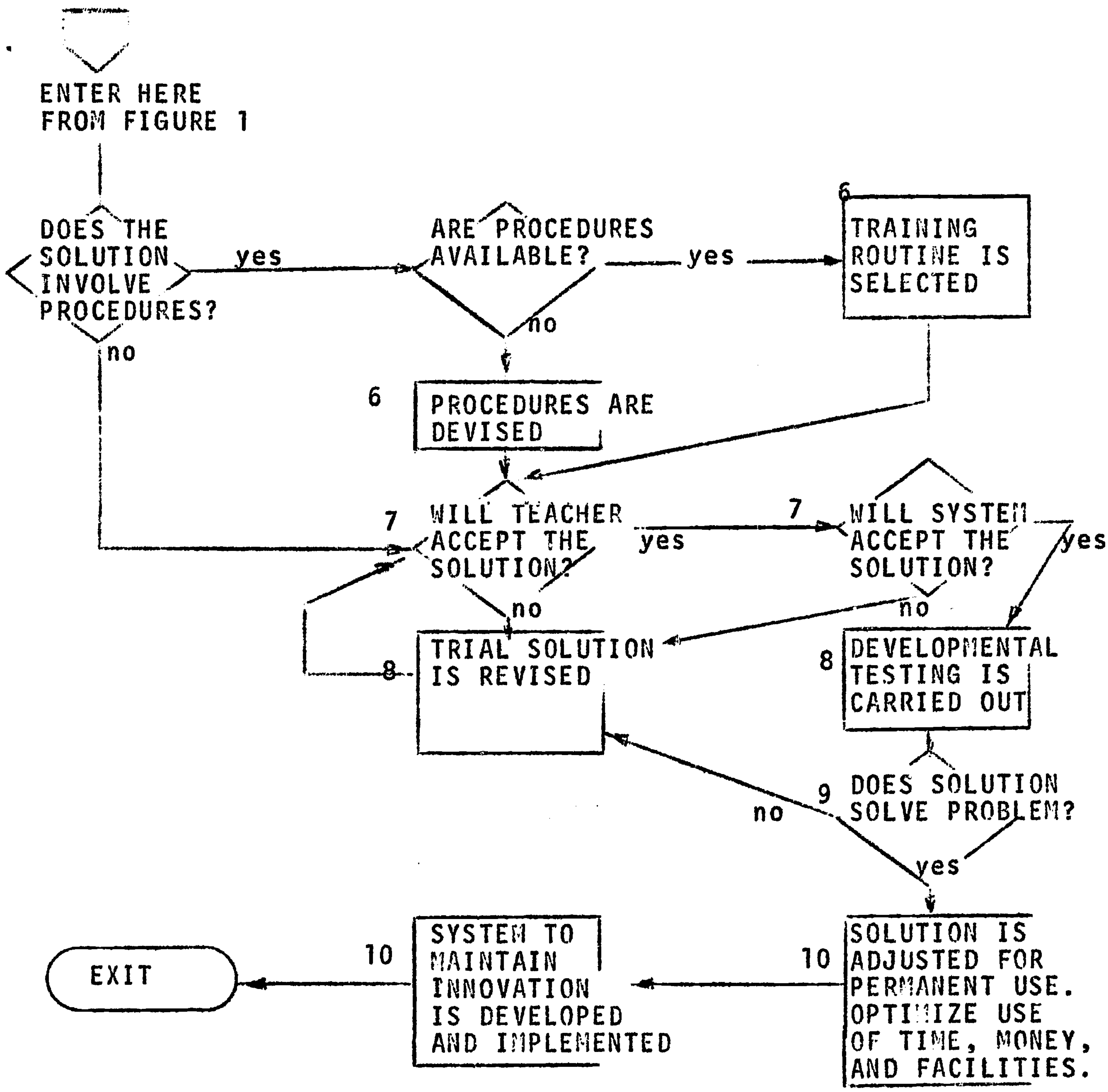

FIG. 2. AN OVERVIEW OF THE INSTRUCTIONAL PROBLEM-SOLVING PROCESS (CONT.)

Fig. 3 Flowchart of ISC-Teacher Tasks

Concerning Problem Explication

These activities represent an expanded view of stages 2 and 4 of the problem-solving process in Fig. 1